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AMS-02 Materials and Processes Summary
Critical Design Review

by
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AMS-02 Materials Certification Requirements

- SSP 30233 Revision F – Space Station Requirements for Materials and Processes
- JSC 27301 D – Materials Control Plan for JSC Flight Hardware
- NSTS 1700.7B, ISS Addendum – Safety Policy and Requirements for ISS Payloads
- Mil.-Handbook.-5H – Materials allowable for Design
- SSP 57003 – Attached Payload Interface Requirements Document. This defines ISS External Contamination requirements

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AMS-02 Materials List

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Unique Support Structure (USS-02) – Upper and Lower

Material	Specification / Manufacturer / Source of Material Allowable	Component	Acceptability
7050 T7451	BMS7-323 Fatigue resistant and Stress Corrosion Resistant Material	Upper and Lower USS Support structures – Tubes, Brackets and Joints. Made from 7050 plates welded with LM developed new Friction Stir Weld process	OK. Welded 7050 test samples showed good results.
7075 T7351	ASTM B 221, QQ-A-250/11	Upper USS-02 Tubes, PAS Components	OK
Inconel 718, Age Hardened Condition	AMS 5589	Trunnion	OK

TENSILE RESULTS OF 7050 FSR WELDED SAMPLES

• **Revised RITF Material Test Report**

•Customer:	**Report Number:**		
•Lockheed Martin / EM	**JSC Receiving Inspection and Test Facility**		0200455
•Houston	**Johnson Space Center - Building 15 Hibay - M/S NT311**	**Description:**	
•Requester/Phone:	**Houston, Texas 77058**	REDUCED SECTION	
•John Figert	**Fax 281-483-0355 Voice 483-0366**	**Part Number:**	
•281-483-8919	AMSFS-02-030-T1 thru		
•Fax Number:	**Manufacturer:**		
•281-244-1301	ES6		
•Cust. Control No.:	**Distributor:**		
•UNKNOWN	UNKNOWN		
•Date Received:	**Lot Number:**		
•4/15/2002	UNKNOWN		
•Date Completed:	**Quantity Tested:**		
•4/17/2002	10		

• **MECHANICAL PROPERTIES**

•TENSILE TEST RESULTS **Test Procedure:** ASTM E8

•Requirement: None

•	**ULT.**	**YIELD**				
•	**STRENGTH**	**STRESS**	**% REDUCTION**			
•SAMPLE ID	**(PSI)**	**(PSI)**	**OF AREA**	**% ELONGATION**	**PASS/FAIL**	**TEST**
COMMENTS						
•0200455-000	72908.0	59840.	-N.M.-	7.0	N/A	T1
•0200455-001	73580.0	63320.	-N.M.-	-N.M.-	N/A	T2; Fracture
occurred outside guage marks.						
•0200455-002	73239.0	60980.	-N.M.-	7.2	N/A	T3
•0200455-003	73925.0	62362.	-N.M.-	8.6	N/A	T4
•0200455-004	73716.0	61102.	-N.M.-	5.7	N/A	T5
•0200455-005	73386.0	61890.	-N.M.-	7.0	N/A	T6
•0200455-006	74433.0	62064.	-N.M.-	7.4	N/A	T7
•0200455-007	74494.0	60952.	-N.M.-	7.6	N/A	T8
•0200455-008	74334.0	66220.	-N.M.-	7.8	N/A	T9
•0200455-009	73899.0	62677.	-N.M.-	8.3	N/A	T10

•Measurement uncertainty +/- .45%

•Gage Length: 2.00 inch(s)

•REVISION REASON: Corrected test comment for sample -000

•SPECIAL NOTES: **None**

•REPORT APPROVED BY: Lisa P. Stephens **DATE APPROVED :** 4/22/2002

•TITLE: Senior Technician

• **THESE TEST RESULTS RELATE ONLY TO THE SAMPLES TESTED. THIS REPORT SHALL NOT BE REPRODUCED,**

• **EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.**

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Unique Support Structure (USS-02) – Upper and Lower (Contd.)

Material	Specification / Manufacturer / Source of Material Allowable	Component	Acceptability
Al. Alloy 1100 –H19	M 22499/1-077	Non-Structural Shims	OK
Custom 455 H 1000 (Age Hardened at 1000F)	AMS 5617	Shear Pin, Sill Trunion	OK.
Al. Bronze HR50 Cold Worked and Annealed	AMS 4640	Various Bushings	OK. Good Material for bushing application
Al. Alloy 6061 T651	QQ-A-250/11	PAS Components, SILL Plate	OK

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Unique Support Structure (USS-02) – Upper and Lower (Contd.)

Material	Specification / Manufacturer / Source of Material Allowable	Component	Acceptability
316L Stainless Steel	QQ-S-763 or any Industry qualified specification	Capture Bar Retainer, PAS	OK
A286 Heat Resistant Steel, Age Hardened	AMS 5737	Capture Bar, PAS	OK
15-5 PH H1025	AMS 5659 or any qualified specification	PAS Components	OK
CRES Wire	NASM 21209 Locking Helicoils	Locking Device for structural fasteners	OK

Unique Support Structure (USS-02) – Upper and Lower (Contd.)

Material	Specification / Manufacturer / Source of Material Allowable	Component	Acceptability
CRES 303 or A286	MS 51831 Heavy Duty Key Locked Inserts	Locking Device for Structural Fasteners	OK
Ever lube 620C Dry Film Lube (MoS2 / Phenolic Binder)	MIL-L-4601	Diagonal Strut Rod End Bearing	OK
Aeroglaze or Superkoropon Epoxy Primer	Lord Corporation / Courtalds Aerospace	Corrosion prevention primer	OK in configuration
Aluminum Alloy and Monel Rivets	NAS1398	Blind Rivets	OK
15-5PH / CRES 440C / PTFE Lined Bearing	MIL-B-81935	Diagonal Strut	OK

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Unique Support Structure (USS-02) – Upper and Lower (Contd.) Corrosion Protection Plan

- All Al. Alloy piece parts to be anodized per MIL-A-8625, Type 2 Class 1 or Class 2 Dyed (Per Federal Standard 595).

- Faying Surface on all Aluminum alloy piece parts (especially 7075 and 7050 parts) shall be Chemical conversion coated (MIL-C-5541) and subsequently primed with Super Koropon 515-700 / 910-740 or Aeroglaze 9743

- Insert holes, rivet holes, counter bored holes and straight through bolt holes shall be Chemical Conversion coated (MIL-C-5541). Inserts shall be wet installed using Super Koropon 515-700 / 910-740 or Aeroglaze 9743 primer.

- Aluminum Bronze Bushings have severe galvanic corrosion problems with Aluminum structure interface. All Aluminum Bronze parts shall be wet installed with primer as noted above.

- All Stainless parts shall be cleaned and passivated per AMS - QQ-P-35. Shear pins made of Custom 455 shall be installed with primer as noted above.

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Vacuum Case Assembly

Material	Specification / Manufacturer / Source of Material Allowable	Component	Acceptability
7050 T7451 Rolled Ring Forging	AMS 4108	Upper and Lower Support Ring	OK. Stress Corrosion Resistant material.
2219 T62 Plate, Spin Formed	AMS-QQ-A-250/30	Conical Flange	OK
2219 T851 Plate	AMS-QQ-A-250/30	Inner Cylinder	OK
7050 T7451 Rolled Ring Forging	AMS 4108	Outer Cylinder	OK. Stress Corrosion resistant material. MUA shall be written / approved by ES4.

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Vacuum Case Assembly

Material	Specification / Manufacturer / Source of Material Allowable	Component	Acceptability
7050 T7451 Plate	AMS 4050	Interface Plate	OK
Viton 75 Durometer	Parker O-Rings and Seals	Vacuum Case O-Ring Seal	OK. Analysis done to show that O-Ring will not experience temperature lower than –15F
Al. alloy 7050 T7451 Plate	AMS4050	Interface Plate	OK.
CRES A286	MS 51831 Key Locked Inserts	Locking device for structural fasteners	OK
High Vacuum Grease	Dow Corning	O-Ring Grease	OK

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Vacuum Case Assembly
Corrosion Protection Plan

- All Aluminum alloy components (external surfaces only), shall be anodized per MIL-A-8625, Type 2 Class 1.

- The internal surfaces of the inner and outer cylinder of the vacuum case will be masked during anodizing. These surfaces will be subsequently coated with “Irridite” Chemical Conversion coating per MIL-C-5541 Class 1A

- Insert Holes, Rivet Holes, countersunk through bolt holes, counter bored through bolt holes and straight through bolt holes shall be coated with Alodine Chemical conversion coating per MIL-C-5541, Class 1A.

- Faying surfaces outside the vacuum case shall be coated with High Vacuum corrosion protection grease. Two suggested options for grease are a) High Vacuum Grease from Dow Corning or b) Krytox LVP 228 from DuPont.

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Cryo-magnet Assembly and SFHe Tank

Material	Specification / Manufacturer / Source of Material Allowable	Component	Acceptability
Al. Alloy 6061 T651, 250 mm thick	AMS-QQ-A-250/11. For Design Allowable, See Attached Table	Racetrack, Dipole Coil Islands, End Frame Tie Plates	OK. Material approved by JSC Materials per Attached Design Allowable
6061 T6 / T651 6 to 250 mm thick	AMS-QQ-A-250 / 11 or any equivalent industry specification	Various Magnet components	OK
2219 T87 plate or sheet	QQ-A-250 / 30 or any equivalent industry specification	Various	OK
Ti Alloy 6Al. 4V ELI, Condition A	MIL-T-4038 or any equivalent Industry Specification	Dowel Keys (possible application)	OK

Cryo-magnet Assembly and SFHe Tank

NASA Design Allowable for 6061 T651 (250mm) Racetrack Plate

Property	Units	Material Direction	Design Allowable
0.2 % Proof	Ksi	Longitudinal Long Transverse Short Transverse	32 32 30
UTS	Ksi	Longitudinal Long Transverse Short Transverse	39 40 37
Elongation	Ksi	Longitudinal Long Transverse Short Transverse	8 8 5

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Cryo-magnet Assembly and SFHe Tank

Material	Specification / Manufacturer / Source of Material Allowable	Component	Acceptability
Stainless Steel 316 Cable	Design allowable determined by Test (CERTEX / kfk)	Coil to Coil Island Support	OK
Stainless Steel 316 and 304 Bar	ISO 3506 – Source of Mechanical properties	Fastenings	OK.
CRES A286	AMS 5737	Fastenings	OK
S-Glass Fiber / CY219 Epoxy Composite Straps	Material allowable to be determined by test per JSC 28792, Structural Verification Plan	Cold to Warm Support Straps	OK

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Cryo-magnet Assembly and SFHe Tank

Material	Specification / Manufacturer/ Source of Material Allowable	Component	Acceptability
FGR-3 Fiber / CY 219 Epoxy Resin System	Material allowable to be determined by test per JSC 28792, Structural Verification Plan	Cold to Warm Support Straps	OK
T700 Carbon Fiber / Epoxy Resin Composite system	Material allowable to be determined by test per JSC 28792,	Cold to Warm Support Straps	OK
Al. Alloy 5083 H321 Plate	QQ-A-250/6	Helium Tank Plate	OK
Al. Alloy 5083 H321 Rolled Ring Forging	QQ-A-367 for chemistry. Mat. Cert. Test Plan per LM Memo. 4/26	He Tank Ring Forging	TBD

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Cryo-magnet Assembly and SFHe Tank

Material	Specification / Manufacturer/ Source of Material Allowable	Component	Acceptability
Inconel 718, Age Hardened	Any qualified Spec. Material data to be furnished	Belleville springs	OK
316 High Proof SCL Stainless Steel	BS1506	Cold to Warm Support Strap Clevis and Pin	OK

NOTES

a) Certificate of Compliance has been / will be reviewed to verify material allowable provided in OIE-205

b) SCL to provided Corrosion Protection finish information on all of the Cryomagnet / Helium Tank Components.

c) SCL to provide Threaded fastener certification data.

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Transition Radiation Detector

Material	Specification / Manufacturer	Component	Acceptability
EP 121 Epoxy Resin Graphite fabric15HTA5131 EC622 Void Filler Al. 5056 Core	Eurocomposites / Hex cell	Bottom Honeycomb Plate	OK – per SSP30233F
EP 121 Epoxy Resin Graphite fabric15HTA5131	Eurocomposites	Bottom / Top Re-inforcement Ring	OK – per SSP 30233F
Ti6Al 4V	European Qualified Specification.C of C to be verified before certification	Support M-structure brackets	OK
Al. Alloy 7075 T7351	European Qualified Specification.	M – Structure for TRD	OK.
UMS 2526 Carbon Fiber Derakane 470S Epoxy Vinyl Ester Resin	Tenax Dow	Fixation Grid	OK

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Transition Radiation Detector

Material	Specification / Manufacturer	Component	Acceptability
M40J Carbon Fiber L285 Epoxy Resin Al. 5056 Core	Toray Scheufler Hexcell	Octagon Panels	OK. per 30233F
M40J Carbon Fiber L285 Epoxy Resin	Toray Scheffler	Bulkheads	OK per 30233F
UMS 2526 Carbon Fiber Derakane Resin	Tenax Dow	Straw Module Stiffener	OK
Separet 405	Aachen	Radiator	OK

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Transition Radiation Detector

Material	Specification / Manufacturer	Component	Acceptability
Stycast 1266	Emerson&Cuming	Adhesive / Potting in fixation straw / stringer	OK
Hysol EE4215 / HD3561	Dexter Aerospace	Potting Compound	OK
Hysol EA934 NA	Dexter Aerospace	Straw Module adhesive	OK
Araldite AW134	Ciba Geigy	Adhesive	TBD. Not Preferred from an Out-gassing standpoint. May have to take waiver or baked out

TRD Gas System

Material	Specification / Manufacturer	Component	Acceptability
Stainless Steel 304 / 304L	Various qualified manufacturers	Piping, straps, support structure, manifolds etc.	OK
Al. Alloy 6061 (Temper to be furnished)	Any industry standard or specification	Support Structure, Valve body, Mounting for manifold valves	OK
Viton	Any qualified manufacturer (Parker)	O-Ring, pump diaphragm	OK
Carbon fiber (Toray) Epoxy over wrap CRES301 Liner	ARDE Inc.	CO2 or CF4 Pressure Vessel	OK

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Tracker

Material	Specification / Manufacturer	Component	Acceptability
7075 Temper information to be furnished	Wyss, CH	Tracked ladder legs	OK
Al. Alloy 6012 (Temper to be provided)	Allega, CH	Outer Plane Components – Washer, Bushing Inserts	OK.
Al. alloy 5056	Hexcel	Honeycomb Core for Outer Plane	OK
Fiberite HYE 3454-3J (M55) Carbon Fiber – Cyanate Ester Resin	Cytec	Face sheet, Outer Ring and Support Plates	OK. Re-Fight material from AMS-01.

Tracker

Material	Specification / Manufacturer	Component	Acceptability
Airex Foam	Alusuisse-Airex, CH	Tracker Ladder re-enforcement spacer	OK. Completely enclosed inside CFC ladder re-enforcement material and Upilex Film
Upilex (Polyimide Kapton) Film	Cicorel, CH	Ladder Sensor shielding	OK
Epo-Tek H20E and H70E	Epoxy Technology, USA	Front end electronic	OK
RTV 695	N.A.	Conformal Coating	Tested by ESA. Acceptable

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Anti-Coincident Counter (ACC)

Material	Specification / Manufacturer	Component	Acceptability
Aluminum Foil A199	N.A.	ACC Module	OK
Al. Alloy 7075 T7351	N.A.	ACC Photo-multiplier Support	OK
CFC (Tenax fiber / Araldite Resin LY556 / hy917 Hardener	Tenax Fibers, Ciba Giegy	ACC Support Tube	OK
Ti6 Al 4V	Any qualified manufacturer	PMT Support	OK
Araldite AV138 Epoxy	Ciba Giegy	Photomultiplier	OK
Scintillator Fiber Y-11	Kurraray	ACC Module	Tested in AMS-01.

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Anti-Coincident Counter (ACC)

Material	Specification / Manufacturer	Component	Acceptability
BC600 Optical Cement	Bicron	AC600	OK
Polyester (Trevira) fabric – Columbus Optimal Black Cloth	Breuer	ACC Module Light Tightness	OK
CRES A286	Any qualified manufacturer	Fasteners	OK
Viton Sealing Ring	FKM	ACC Module sealing ring	OK
Silicone CV1146 Black Silicone	Nusil	Light Tight silicone Coating	OK

Ring Imaging Cherenkov Counter (RICH)

Material	Specification / Manufacturer	Component	Acceptability
T800H or M55J Fiber Impregnated with EX 1515 Cyanate Ester Resin	Bryte Technologies Incorporated	RICH Reflector	OK for SSP 30233F. Low Out-gassing material
Vacoflux 50 C0-Fe Alloy, Annealed Temper	N.A. Certified by minimum guaranteed properties from manufacturer.	PMT Housing Structure	OK.
Al. 6061 T651	AMS 4025	RICH Secondary Structure	OK
CRES A286	AMS 5731	Reflector Fixation Plates	OK

Ring Imaging Cherenkov Counter (RICH)

Material	Specification / Manufacturer	Component	Acceptability
Al. Alloy 7075 T7351	QQ-A-250/11	Information not furnished	OK
CRES PH 13-8 Mo	AMS 5629	Bolt and Bushing	MUA required
Polycarbonate	Data to be provided	PMT Housing and Light guides	TBD
CRES 302,316	AMS 5524 or any qualified specification	Mechanical parts of RICH Structure	OK

Ring Imaging Cherenkov Counter (RICH)

Material	Specification / Manufacturer	Component	Acceptability
93-500 Silicone Potting Compound	Dow Corning	Potting Compound for PMT	OK for SSP30233F
3140 RTV	Dow Corning	PMT Boards Coating	**Not acceptable**
Viton	Parker Seal	Upper light shielding	Acceptable for Out-gassing. Low Temp. limit for static seal is –15F

Time of Flight (TOF)

Material	Specification / Manufacturer	Component	Acceptability
Al. Alloy 5052	Hexcell	Honeycomb	OK
Al. Alloy 2024 Anodized	Any Qualified manufacturer	Honeycomb Panel face sheets	T6 or T8 Temper is acceptable
Al. Alloy 7075	Any Qualified manufacturer	Brackets, extensions, beams	T73 temper is acceptable
Al. Alloy 6061 T6	Any Qualified manufacturer	Thermal radiators	OK
Plexiglass Acrylic	Any Qualified manufacturer	Light Guides	OK
1743 Cyanoacrylate adhesive	3M Europe	Light Guides	Material data to be reviewed

Time of Flight (TOF)

Material	Specification / Manufacturer	Component	Acceptability
Araldite AV138 /HV998 Epoxy adhesive	Vantico	Cover glue	OK
CV1146-2 Black Silicone coating	Nusil	Light Sealing	OK
CV1152 RTV Silicone Conformal Coating	Nusil	Conformal coating of Boards	OK
Kapton Polyimide Adhesive Tape	N.A.	Wrapping Protection	Adhesive data to be reviewed
Dow Corning 93-500 Silicone Compound	Dow Corning	PMT Pottiing and optical pads	OK
Makrolon GF8325 Polycarbonate w/20% glass fiber	Bayer	PMT Housing and Supporting brackets	OK

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Electromagnetic Calorimeter (EMC)

Material	Specification / Manufacturer	Component	Acceptability
Al. Alloy 7050 T7451 Plate	BMS 7-323	ECAL Honeycomb Corner Brackets	OK
Alloy Steel, Cadmium Plated	MS16998	Bolt / Cap Screw	**Not acceptable.** Suggested change to NAS1351 Cap Screw with A286
CRES A286	NAS1004 / NAS 1005	Bolt	OK
Al. Honeycomb Panel with Al. Skin and Al. Core with Unknown adhesive	To be provided	ECAL Honeycomb Panel	TBD

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Electromagnetic Calorimeter (EMC)

Material	Specification / Manufacturer	Component	Acceptability
Black Polycarbonate	To be provided	Photo-multiplier support	Manufacturer to be provided
Soft Iron with black Nickel Coating	To be provided	Magnetic Shield	OK.
Black Silicone	To be provided	Light Tight seals	TBD.
Therm-A-Gap T274	Parker Hannifin	End Cap Seal	TBD.
Thermoplastic Polyurethane	To be provided	PMT	OK.

Electronic Crates

Material	Specification / Manufacturer	Metal Finish Processes	Component	Acceptability
Al. Alloy 7075 T7351	AMS-QQ-A-250/12	Anodize per MIL-A-8625 type2, class 1 and Alodine class 3 in localized areas	Structural Components	OK
Al. Alloy 6061T6 Plate	AMS-QQ-A-250/11	Anodize per MIL-A-8625 type2, class 1 and Alodine class 3 in localized areas	Crate Components	OK
Oxygen Free Copper Alloy	ASTM B170, ASTM B 179	Nickel Plating per QQ-N-290A	Mechanical Parts	OK
CRES A286	AMS5525, AMS5731	Passivation per QQ-P-35	Mechanical Parts	OK
AISI301,304,316 and 316L	AMS Specs.	Passivation per QQ-P-35	Mechanical Parts	OK

Electronic Crates

Material	Specification / Manufacturer	Component	Acceptability
Eccobond 285/11 Epoxy	Emerson and Cuming	Adhesive for non-structural parts	OK
Scotchweld EC-2216 2-part epoxy	3M Co.	Adhesive for non-structural parts	OK
Cho-Therm 1671 filled Silicone Rubber	Parker Chomerics	Thermal Interface Compound	OK
PEEK with 30% glass fiber	MIL-P-46183	Mechanical Parts	OK
CRES 300 series Screws	NAS1351, NAS1352, MS51959 etc.	Fasteners	OK
CRES 300 series Helicoil	MS21209	Fasteners	OK

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Materials Assessment

Assessment for Materials Certification

Certification of Material Allowable for Structural Analysis

- All Unique Support Structure (USS),PAS and Integration Hardware materials are procured per Aerospace and Military Specifications (ex: AMS, NAS, Mil Specs. Etc.). Materials Certification is based on Certificate of Compliance stating that material meets the requirements of the applicable specifications.

- Cryo-magnet and Helium Tank materials are procured per Industry Standard Specifications (AMS, BS,ISO etc.). Material allowable is taken from MIL-H-5 or "Handbook of Materials for Super-conducting Machinery", Battelle Labs or Manufacturer furnished Minimum Guaranteed properties. Allowable for Material out of scope of MIL-H-5 is certified by testing specimens from every piece of stock material procured. Material allowable is documented in OIE-205 (SCL Document). Materials Certification is based on Certificate of Compliance stating that material meets the requirements of the applicable specifications or minimum guaranteed properties.

Assessment for Materials Certification

Certification of Material Allowable for Structural Analysis (Contd.)

- Certificate of Compliance (C of C) for some Cryo-magnet materials have been received. C of C for none of the other Experiment Subsystems structural materials have been received.

Stress Corrosion Cracking

- Most structural materials used in AMS-02 are “A” rated per MSFC-STD.-3029. 7050 T7451 has medium to high SCC resistance. However, this is “B” rated per MSFC-STD-3029. So MUA is required.

- Stress Corrosion Tests for 7050 Friction Stir welded samples in work. Results will be documented in the MUA.

- Other materials which are “B” rated are Custom 455 H950 (used in USS-02 shear pin) and CRES PH 13-8 Mo (RICH Bolt). MUA is required. No major technical issues or show stoppers.

Assessment for Materials Certification

Corrosion

- Corrosion control for the USS and PAS will be done by the "Corrosion Control Plan" as detailed in an earlier slide. Corrosion control for the Cryo-Magnet / Helium Tank and all other experiment subsystems will be done by the guidelines of the "Corrosion Control Plan" as much as feasible. Deviations will be noted.

  NOTE: Corrosion control for experiment subsystems (especially type of corrosion protective finishes) to be provided to LMSO.

Atomic Oxygen / Vacuum Ultra-Violet (VUV) Degradation

- All Non-Metallics will be enclosed inside a metallic component or covered by a AO/VUV resistant material (MLI Thermal Blankets, Beta Cloth or Metal shield.). Hence, Non-Metallics will not have a direct line of sight with the AO/VUV Fluence.
- Ag – FEP Blankets if used as the external layer of MLI will have a minimum of 10 mil thickness for the Teflon (ISS Vehicle data) for 3 year on orbit life.
- Silver plating is avoided on all fasteners and other components.

Assessment for Materials Certification

Thermal Vacuum Stability / Out-gassing

- All materials used in AMS-02 meet the requirements of SSP30233 F, Space Station Requirements for Materials and Processes with noted deviations. Most materials are "A" rated per ASTM E 595. Few materials are "C" rated, but they are completely enclosed inside "A" rated materials. MUA's will be written for non-A rated materials.

- Verification of Attached Payload External Contamination Control Requirements per SSP 57003 – A successful meeting took place between the NASA ISS External Contamination Team and the LMSO AMS-02 Team during September, 2001. All Out-gassing data collected till date was presented. ISS External Contamination Team did not express any major showstoppers. However, the Contamination team will do an analysis based on NASAN geometric model. ISS External Contamination may define additional testing requirements during CDR based on initial AMS-02 materials review and NASAN analysis. No material change will be done.

  It is to be noted that LMSO / NASA-JSC materials certification will not cover ISS external contamination requirements. This certification only covers SSP 30233F (E595) requirements. SSP 57003 requirement will be verified by ISS / Boeing Contamination based on test data provided by LMSO.

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Fastener Certification

Fasteners

- Fastener Integrity verification is done per JSC 23642 C, “JSC Fastener Integrity Testing Program” . All fasteners shall have positive back-off prevention such as mechanical locking features like Helicoils, Keeinserts, Locknuts, safety wires or fused locking elements. Deviations to this shall be noted in the Materials certification and adequate rationale provided.

- Structural fasteners (Fail safe and Safe Life) ,#8 and larger will be lot tested per lot / sample size of JSC 23642. Fracture Critical fasteners will be proof tested or NDE inspected per the NASA Fracture Control Plan.

- All structural fasteners are procured from JSC / LM Approved Manufacturer’s and Distributors. Fasteners will be certified by verifying Certificate of Compliance and Material Test Report (MTR). For Fracture Critical fasteners, procurement of mixed batches of fasteners will be avoided.

Conclusion

- Materials Assessment for AMS integration hardware and experiment components is more than 90% complete

- Acceptability of each material has been assessed based on its location, environment and quantity of usage. The specific material properties of critical importance in AMS-02 are Mechanical properties of structural materials, Stress Corrosion Cracking and Corrosion properties for metals, Outgassing in vacuum and Atomic Oxygen/VUV resistance for non-metals and Temperature resistance for all materials in the use environment.

- Some materials information in experiment components are incomplete (ex: temper of structural Al. Alloys missing). These kinds of information will be gathered from the European collaborators prior to hardware fabrication and certification.

- Materials and Processes used in the AMS-02 payload is acceptable for ISS